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(12) UK Patent Application (19) GB (11) 2 044 297 A

(21) Application No 7923030
(22) Date of filing 3 Jul 1979
(30) Priority data
(31) 242354U
(32) 16 Mar 1979
(33) Spain (ES)
(43) Application published 15 Oct 1980
(51) INT CL³ D06F 25/00
(52) Domestic classification D1A B1 D3 D6 F1A K3 N2 N5 N7A N8B N9A2 N9C W2 F4G 1C2A 1C4 1M2 2C1B
(56) Documents cited GB 1495869 GB 1481259 GB 1475130 GB 1472688 GB 1276175 GB 981437 GB 972411 GB 799859 GB 748510 GB 320927
(58) Field of search D1A
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(54) Clothes Washing Machine Incorporating a Drying Device

(57) A clothes washing machine of the front loading type is provided with a hot air clothes dryer for drying the clothes after washing. A fan (14) draws air from within the machine casing (1) and blows it through a heater box (21) containing electrical resistance heating elements (26) and into a rotary clothes-receiving drum (4) located within an outer container (2) which retains the washing water during the washing cycle. The path of the hot air is from the heater box into the container (2), through the front loading aperture (5) of the drum (4) and then through circumferential outlets in the drum (4) to a rear outlet (6) from the container (2) and through an exterior conduit (12) having at its outlet a removable circular ring (13), a stem (35), Fig. 9, and bristles (36) to retain lint (37) from the washed clothes. In another embodiment, Figs. 2 and 3 (not shown), the container outlet (6) is connected to a condenser (32) so that a closed circuit is formed for the drying air.

FIG.1

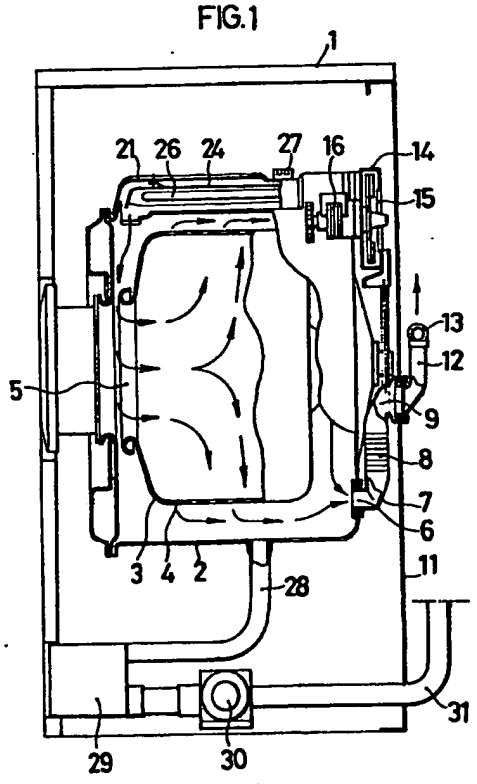

FIG.9

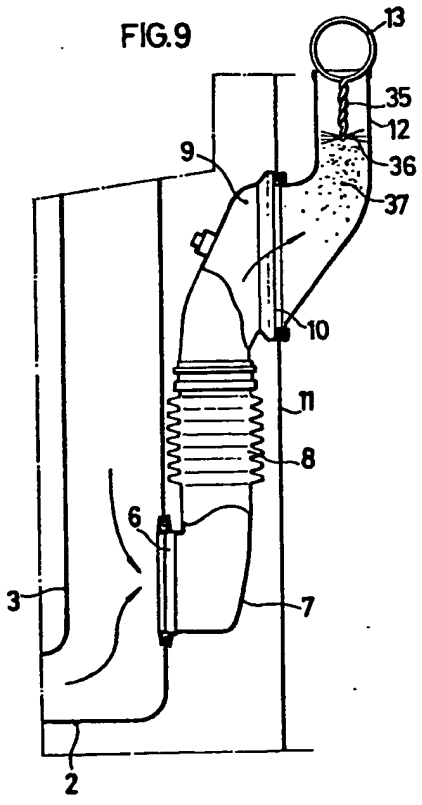

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FIG.1

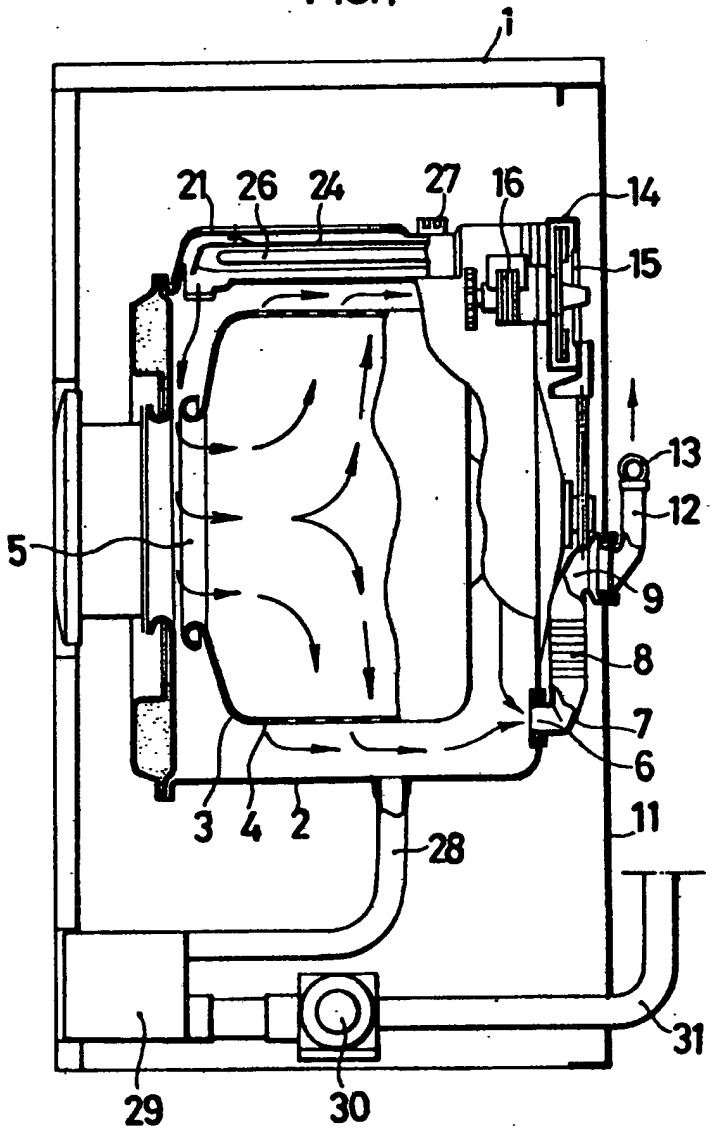


FIG.2

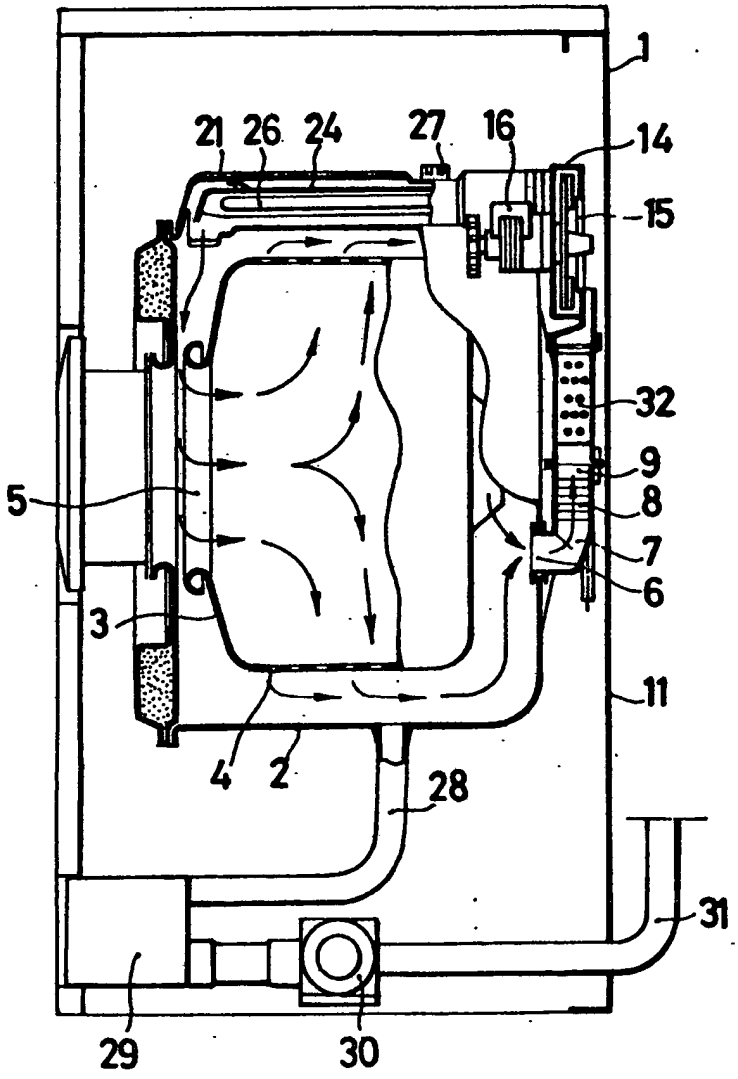


FIG. 3

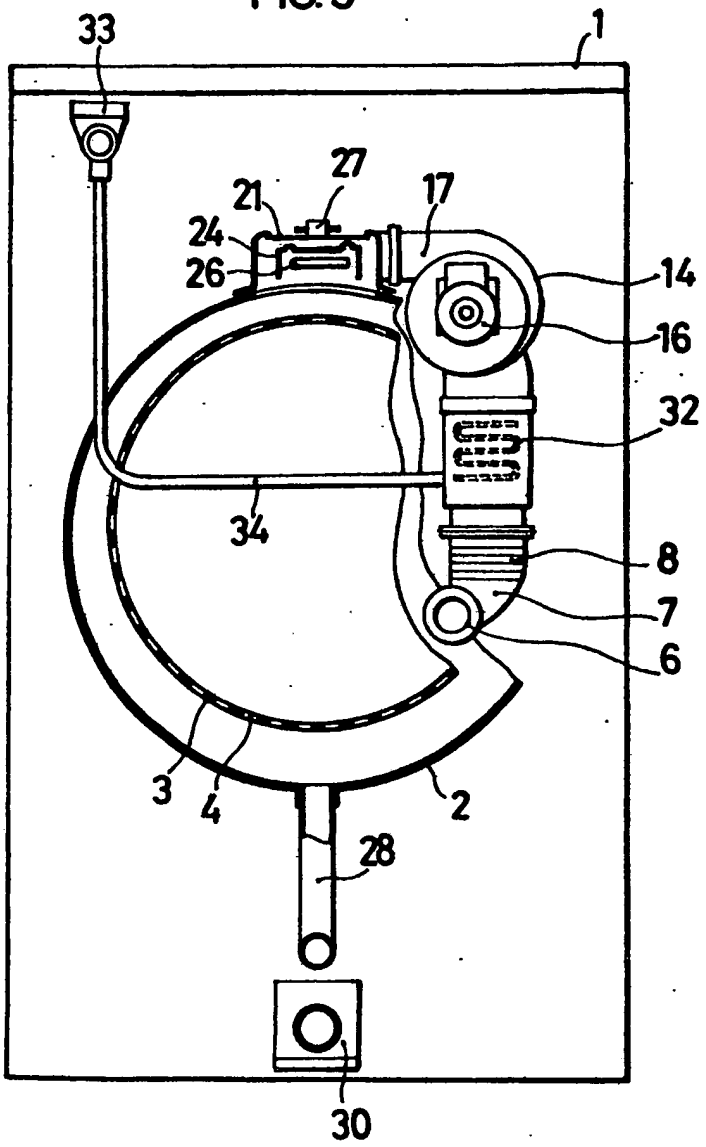


FIG. 4

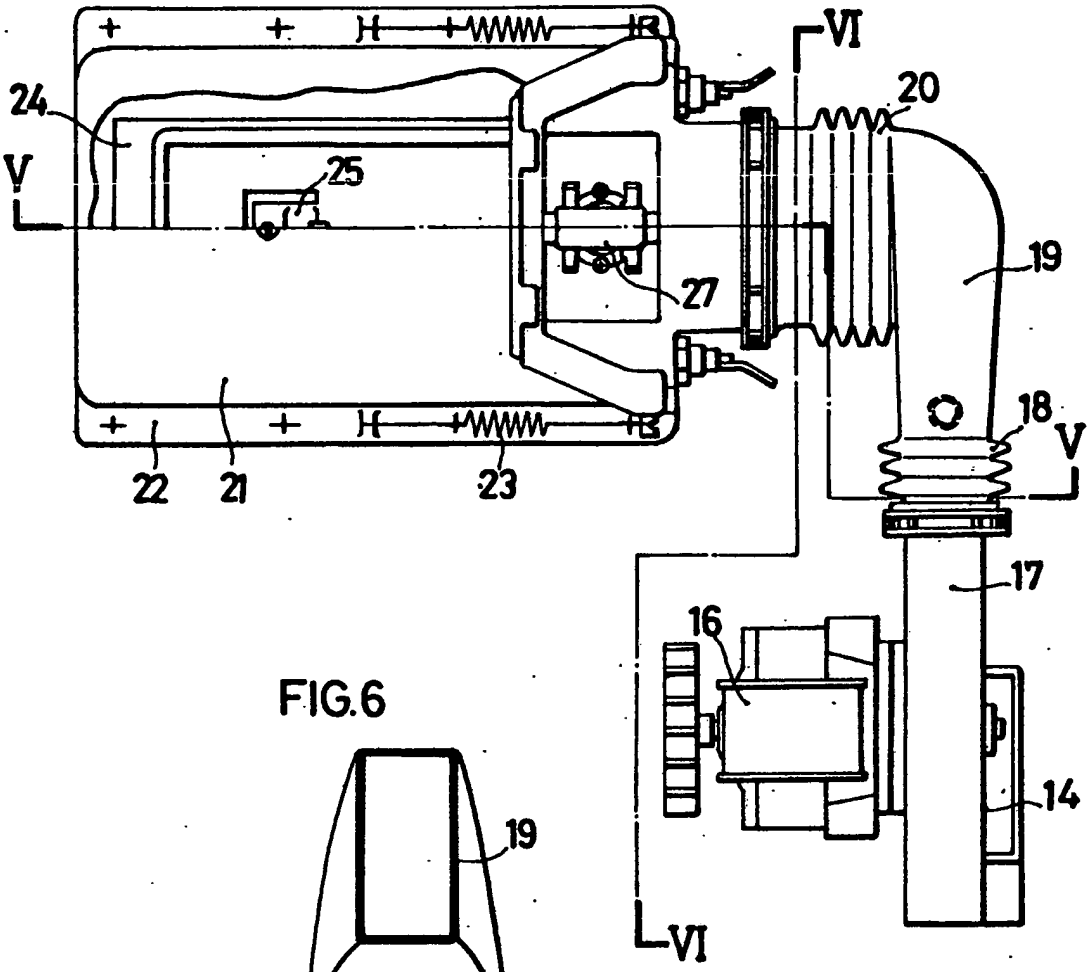


FIG. 6

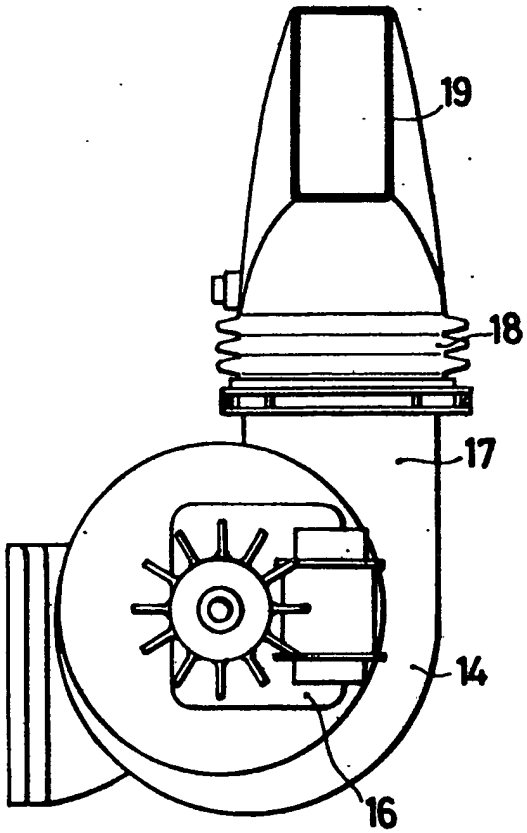


FIG.5

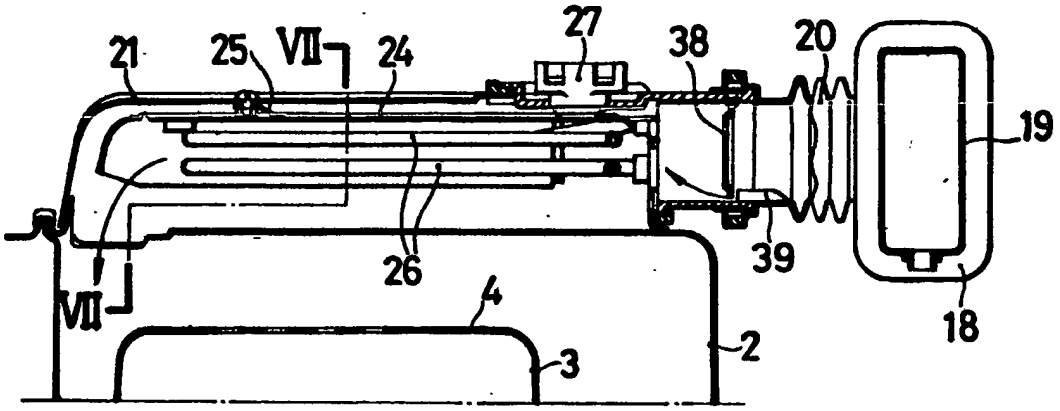


FIG.8

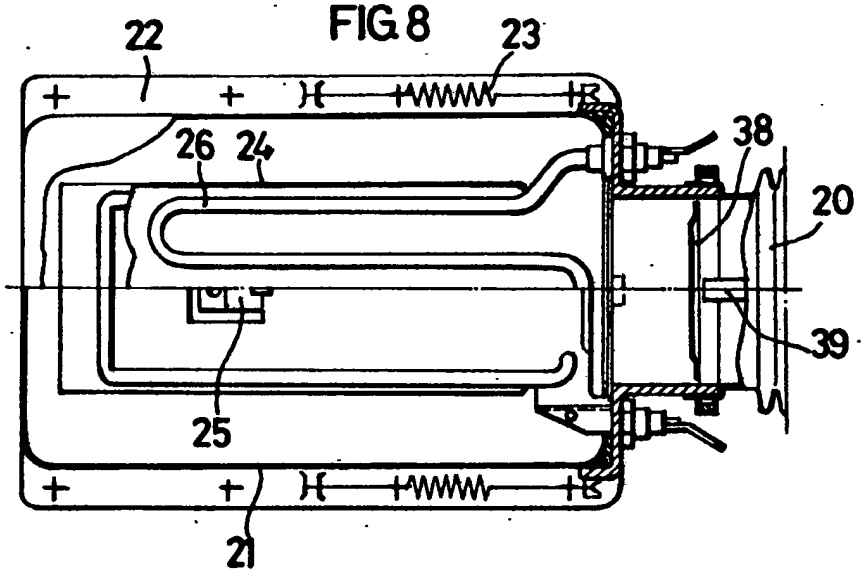


FIG.7

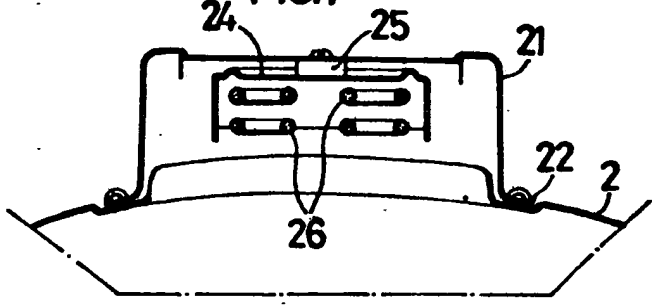


FIG.9

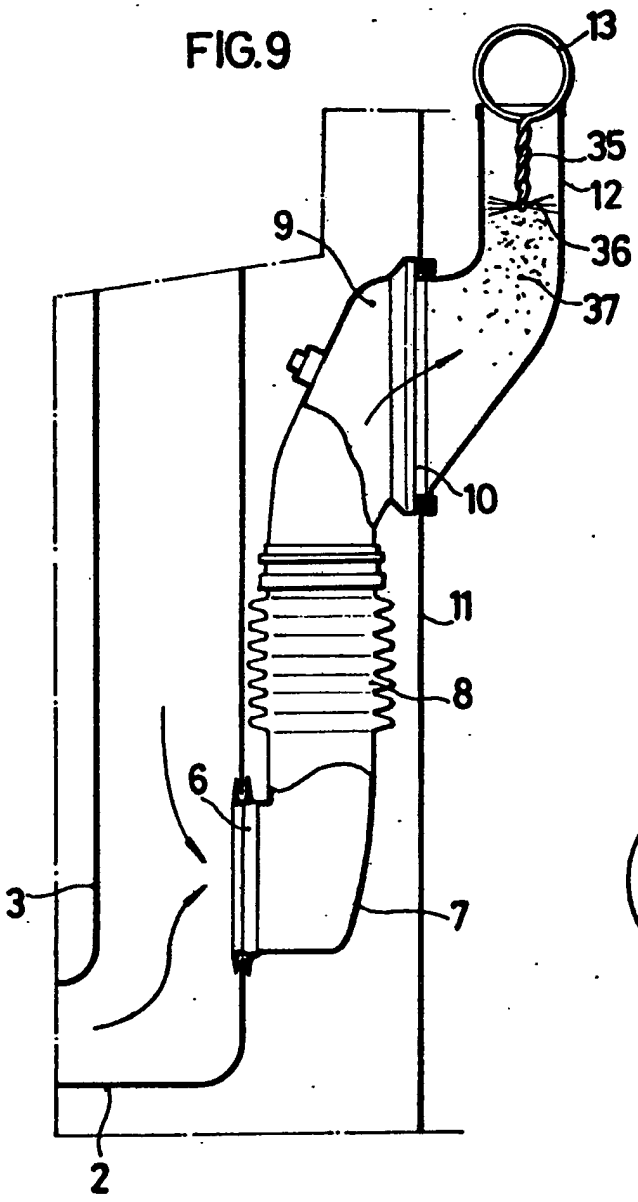
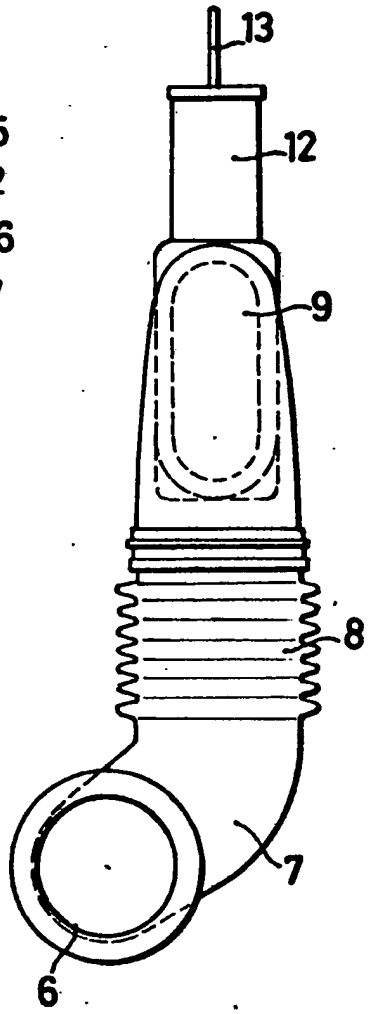


FIG. 10



SPECIFICATION

Clothes Washing Machin Incorporating A Drying Devic

This invention relates to a clothes washing machine incorporating a drying device designed to function in such a manner than the wetness in the clothes after washing is removed almost entirely in such a way that the clothes on being taken out of the machine require only a light final drying.

The invention accordingiy provides a clothes washing machine incorporating a drying device arranged to operate after the washing of the clothes and comprising a centrifugal fan of which the inlet is located within the outer casing of the machine and the outlet is connected to the inlet of a heater box fitted with an array of electrical resistance heating elements and of which the outlet connects with the space between a rotary clothes receiving drum and the outer container for said drum, the arrangement being such that air driven through said heater box by the said fan is caused to circulate through said rotary drum.

The invention is illustrated by way of example in the accompanying drawings, in which:

Figure 1 is a sectional side elevation of a washing machine with a drying drvice, in accordance with one embodiment of the invention,

Figure 2 is a similar view of another embodiment of washing machine in accordance with the invention,

Figure 3 is a front sectional elevation corresponding to Figure 2,

Figure 4 is a part sectional plan view of the essential components of the drying circuit,

Figure 5 is a longitudinal section in a vertical plane along the line V—V of Figure 4,

Figure 6 is a vertical section on the line VI—VI of Figure 4,

Figure 7 is a vertical section of the air heater component on the line VII—VII of Figure 5,

Figure 8 is a part sectional plan view of the heater component, and

Figures 9 and 10 are respectively a part sectional side elevation and a front view showing to a larger scale the hot air outlet conduit to the exterior.

Referring to the drawings, the items enumerated in the drawings correspond to the following components; 1 outer frame of the washing machine which comprises the inner container 2 and this in turn, the rotary drum 3, provided with orifices 4 in its cylindrical section and the mouth 5 through which will pass the hot air to the interior and which will effect the drying of the clothes after washing;

6, opening in the r ar lower part of the container 2, to which is fitted a conduit 7 for suction, joined by a bellows 8 to c nduit 9 which is held by a flange 10 to th plat forming the rear wall 11 of th machine fram ; the conduit 12 coming through to th outside, and of which the nd has a separable compon nt 13;

14 a centrifugal fan of which the central air inlet 15 c mmunicat s with the space inside the machine which is normally higher in temperatur than ambient; it also caus s an internal convection current which contributes to the cooling of the space as well as the components which are therein situated and which heat due to its operation;

16 motor associated with the fan 14 of suitable electrical and mechanical characteristics;

17, exit conduit for the air from the fan, connected through a bellows 18 with conduit 19 which communicated through the bellows 20 with the box 21, heating the circulating air.

The said heater box has lateral flanges 22 by which it is fixed by spot welding to the upper part of the container 2 of the machine, there being in that part, springs 23 for the separate attachment of the tray 24 which encloses the group of electrical resistances 26, being preferable of the shielded type; 25, a tab stamped out from the tray 24 for its attachment to the box 21 by means of a screw. The hot air after passing through the battery of resistances is directed towards the inside of the space formed between the container and the rotary drum and then to the interior of the latter, following the direction of the arrows shown in Figures 1 and 2. The thermostat 27 will control the operation of the resistances;

28 a water outlet conduit passing through a filter which can be cleaned situated in a box 29 accessible from the front of the machine, the water being sent through the pump 30 to the conduit 31 for rear outlet.

The condenser 32 in the model shown in Figures 2 and 3 causes the condensation of the water vapour present in the hot air after its passage through the washed clothing, 33 being an electro-valve controlling the passage of the water through the pipe 34, entering the said condenser.

The operation of the described device can be seen from the view in Figures 1, 2 and 3 and can be summarized as follows: the air drawn in by the fan from the interior of the machine frame and sent by the fan across the battery of resistances, then circulating through the washed clothes extracts from them the greater part of their water and then leaves through conduit 7 passing in the first case directly to the outside and passing in the second case through the condenser 32 where it loses almost all the water it has extracted, then being taken in again by the fan 14 and sent again through the resistance heaters. It will be noted that in the latter case the air is recycled and thus one avoids discharging into the atmosphere the water extracted from the clothing, a fact which whil it may not be of much importance with th machine operating in the open air, could take on a maj r importance in the case of the machine operating within a confined spac , in th absence f a v ntilating shaft to th outside, and wh r the discharge of th humid air would not be tolerated.

The component formed by th circular ring 13,

the stem 35 and th bundle of bristles 36 is placed in th mouth of the pipe 12 and serves to prevent th possible dispersal o the xt rior of the down 37 which usually is given ff by clothes due to the friction during the action of washing, the radially disposed bristles 36 retaining the down without in any way impeding the passage of the air. This component can be removed for cleaning from time to time removing the fibres held by the bristles.

The swinging component 38 of rectangular shape, and articulated on its upper side, can move in the direction of the hot air current, but not in the contrary sense, due to the presence of a stop 39 thus forming a non-return mechanism for the said hot air.

Claims

1. A clothes washing machine incorporating a drying device arranged to operate after the washing of the clothes and comprising a centrifugal fan of which the inlet is located within the outer casing of the machine and the outlet is connected to the inlet of a heater box fitted with an array of electrical resistance heating elements and of which the outlet connects with the space between a rotary clothes receiving drum and the outer container for said drum, the arrangement being such that air driven through said heater box by the said fan is caused to circulate through said rotary drum.

2. A clothes washing machine as claimed in Claim 1, in which the machine is a so-called front-loading machine and said outlet from said heater box is so arranged that air blown therefrom enters said rotary drum through th front ap rture thereof and is discharg d through apertures in the circumferenc f the drum.

3. A clothes washing machine as claimed in Claim 1 or 2 having an outlet conduit for the air flowing within the space between the said outer container and the rotary drum of the machine, this conduit being fitted to the rear part of the container and connecting through a flexible pipe with a second rigid conduit which passes through the rear wall of the frame of the machine for the purpose of expelling the hot air and carrying the water extracted from the clothes to atmosphere, there being in the mouth of the said conduit a removable means for the retension of lint entrained within the hot drying air, said retention means including a plurality of bristles arranged radially in batches at the end of a spindle fitted with a ring of a diameter greater than the mouth of the external pipe for holding it in position.

4. A clothes washing machine as claimed in Claim 1 or 2, in which an outlet conduit for the air flowing from within the space between the said outer container and the said rotary drum is connected with the means for condensing the water vapour drawn off by the hot air, and an outlet from the condenser means is connected to an air inlet to the centrifugal fan, whereby a closed circuit is formed for said drying air.

5. A clothes washing machine substantially as described herein with reference to the accompanying drawings.

6. The features as herein described, or their equivalents, in any noval selection.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1980. Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.